Evaluation of In-Vessel Composting for Poultry Mortality

Gary A. Flory, Agricultural Program Manager
Virginia Department of Environmental Quality
4411 Early Road
P.O. Box 3000
Harrisonburg, VA 22801

ABSTRACT

Finding a cost-effective alternative to rendering for the biosecure and environmentally sound disposal of poultry daily mortality was the focus of research conducted by the Virginia Department of Environmental Quality (DEQ) in cooperation with the United States Department of Agriculture (USDA), the Virginia Department of Agriculture and Consumer Services (VDACS), Cargill Turkey Products, Pilgrim's Pride, and George's Foods. Gary Flory and Dan King of DEQ's Valley Regional Office, Agricultural Program, led the research.

After reviewing the available alternatives, DEQ chose to pilot in-vessel composting because it appears to be a cost-effective and practical solution to daily mortality disposal. In addition, the process produces immature compost that may be further processed depending on its intended use. Within Virginia, in-vessel composting was largely untested as a disposal method for daily mortality. Currently, bin composting and incineration are the primary alternatives to rendering for mortality disposal.

KEYWORDS

In-Vessel Composting, Daily Mortality, Poultry Composting, Carcass Disposal

INTRODUCTION

DEQ was recently involved in managing a low pathogenic avian influenza outbreak in Virginia. A task force comprised of USDA's Animal, Plant Health Inspection Service (APHIS), Forest Service, Farm Services Agency, and Natural Resources Conservation Service, Virginia's poultry industry, Virginia's Department of Agriculture and Consumer Services (VDACS), and DEQ worked cooperatively to contain the low pathogenic avian influenza outbreak and prevent its spread.

After examining data collected from avian influenza positive farms, USDA epidemiologists concluded that rendering of daily mortality represented a greater risk of disease transmission than other common methods of mortality disposal. Based on this

evaluation, the poultry industry decided to eliminate rendering as an option for the disposal of daily mortality.

At the time of this decision, approximately 300 poultry producers were using rendering as their primary means of mortality disposal. These producers were left with an immediate need for a new method of disposal.

METHODOLOGY

After researching the available technology, DEQ contacted RKB Enterprises of Norfolk, Virginia to provide the equipment for the pilot project. A Type 408 GREENDRUM Poultry Mortality Composter (see Figure 1) was mobilized on June 26, 2002. This in-vessel composter system uses a rotating drum 4 feet in diameter and 8 feet long, which rotates 3 times an hour. It has a total working capacity of 2.45 yds^3 and a continuous daily capacity of 1 yrd^3.

Figure 1.

On June 26, 2002, 100 pounds of fresh turkey carcasses and 500 pounds of frozen broiler carcasses were mixed with poultry litter and loaded into the composter. During the initial phase of the project, the carcasses were cut into several pieces to enhance the microbial degradation. The carcasses and litter were mixed at a ratio of 1 part carcasses and 3 parts litter. Other carbon sources such as sawdust, peanut hulls, and wood shavings may be substituted for poultry litter. Subsequent trials were conducted on broilers, meat turkeys, waste eggs and large breeder turkeys.

Each day of the pilot project, between 100 and 250 pounds of poultry carcasses were added to the composter and compost temperatures were taken. Within 48 hours of starting the project, temperatures within the composter reached 140 degrees and averaged 145 degrees for the life of the project; sufficient to reduce many pathogens.

Moisture content is a critical factor for any type of composting. The team added water to the unit periodically to maintain the desired moisture content of approximately 50%. In order to represent actual working conditions on a poultry operation, moisture content was estimated and not analytically measured.

Periodically, the material within the unit was evaluated. After the unit reached initial temperatures, poultry carcasses would be reduced to bones within 48 hours. Birds ranging in size from day old chicks to 70 pound breeder toms were placed within the composter in several conditions: cut into pieces, with an opened chest cavity, and whole. All carcasses composted equally well in all conditions.

About 1 cubic yard of compost was removed from the unit 7 days after the project began. This material was immature compost that could be land applied as a soil amendment. As seen in Figure 2, some of the larger bones remain intact. Sale of the resulting compost would require further composting. Screening may also be necessary.

Figure 2.

ECONOMICS

DEQ conducted an economic comparison of composting methods and 2 common mortality incinerators (Table 1). Based on this analysis, the composting methods (both static pile and in-vessel) appear to be more cost-effective when annual operation costs are considered. However, the initial purchase price of the unit may be cost prohibitive.

CONCLUSIONS

In-vessel composting offers poultry producers a variety of benefits: low operational costs, fast processing time, ability to process large breeder birds and an end product which can be sold or used. In-vessel composting also provides a viable option for producers who do not have a suitable site for incineration. Disadvantages include high purchase cost and the requirement for proper management. In-vessel composting may not be the ideal disposal solution for all producers, but it does represent an biosecure and environmentally viable alternative to rendering.

Table 1

COMPARISON OF METHODS FOR THE DISPOSAL OF POULTRY DAILY MORTALITY

ITEM	COMPOSTING		INCINERATION	
	A. Four-Bin With roofing	**B. In-Vessel** Greendrum - 408	**A. R & K Incinerator** Burn-Easy	**B. Shenandoah Mfging** Model A-10
Equipment Cost*	$10,560--includes carbon storage and concrete pad.	$12,000 plus $2,100 shipping = $14,100	$4645 including shipping	$8,000 - $10,000
Labor	15 min/day	15 min/day	15 min/day	15 min/day
Additional Costs*	Fuel for front-end loader ($50/year).	Electricity needs for 1/6th HP motor ($85/year). Concrete pad and dry storage for carbon source recommended but not required ($5,000 if a building is not available).	Electricity needs for blower motor ($50/year). Fuel Cost ($3,000/year)* Concrete pad ($500). Site certified by engineer in Rockingham County ($250).	Electricity needs for blower motor ($50/year). Fuel Cost ($5,000/year)* Concrete pad ($500). Site certified by engineer in Rockingham County ($250).
Annual Operational Cost*	$50	$85	$3,050	$5,050
Capacity	Normal daily accumulation	250 to 300 lbs./day	225 lbs./day	250 lbs./day
Area	Varies with operation.	Concrete pad -- 7" X 17"	Concrete pad – 6' X 8'	Concrete pad – 6' X 8'
Benefits	Low operation costs, end product which can be sold or used on-farm.	Low operation costs, end product which can be sold or used on-farm, faster processing time, front-end loader not required.	Burn as accumulated, No rodents, flies, or transfer of disease.	Burn as accumulated, No rodents, flies, or transfer of disease.
Disadvantages	Front-end loader required, long processing time, requires management.	Requires management.	High operating cost. Smoke and odor potential.	High operating cost. Smoke and odor potential.
Fuel Use/Burn Time	NA	NA	3 hours/3.5 GPH (secondary unit 3/4 second retention time at 1600 degrees F)	5 hours/ 7.3 GPH (secondary unit 1/4 second retention time at 1400 degrees F)
End Product	Compost	Green Compost	1 gallon ash/100 lbs.	5 % of original weight in ash
Weight	NA	3000 lbs.	1000 lbs.	2000 lbs.
Comments	Load - 12" litter, birds, 6" litter. 20 – 30 days for total cycle.	Mix: 1 part bird to 2 litter. Process time--5 to 7 days.	One year warranty.	One year warranty. Company recently purchased.
Permit Required	Building Permit, VDACS Composting Permit	Building Permit, VDACS Composting Permit	Building Permit, Air Permit	Building Permit, Air Permit

* All costs are estimates.